

## Implications for USDOT Policies

Several participants at the regional meetings expressed their frustration at what they regarded as a lack of coherent, mutually supportive national policies that support the intermodal transportation infrastructure that is vital to the health of ports and to our Nation's economic competitiveness. These speakers observed that it is monumentally expensive to meet corridor transportation demands and there is neither the awareness nor the financial commitment to address them. At every meeting it was pointed out that our country is already impacted by new east/west trade corridors, and that the cities that are gateways to these corridors—and are traversed by them—don't have the resources to invest in the new infrastructure that is needed. Port industry representatives noted that the U.S. Treasury receives \$150 billion annually in tax revenues from goods handled by U.S. ports, and continued investment in our ports is essential to ensure that they remain competitive in the global economy and act as a vital component of our national security infrastructure. Under-investment in these facilities, and the transportation infrastructure that serves them, was seen as a national problem that will take national money to correct.

Questions relating to the private sector share of project investment and impact mitigation were frequently raised at the outreach meetings. Many of the people present thought that those parties who profit directly from freight movements ought to pay for mitigating the negative impacts of those movements. For example, parties responsible for generating and carrying the freight handled by ports should pay for mitigating the adverse impacts of that freight as it is transported through other regions and States. The private sector share of the money to offset these negative impacts would come from the steamship lines, commercial motor carriers, and the railroads. Even in instances where federal funds will not constitute a major portion of project financing, many participants believed that federal funds and federal participation would be essential in forming project partnerships by being the magnet that could draw the parties and funding sources together.

An interesting analogy was raised concerning differences in the approach of transportation equipment manufacturers and carriers to public authorities on aviation issues versus the approach to public authorities on port issues. The aircraft manufacturers were willing to talk to the airport community to ensure that their new generations of planes could land at as many airports as possible. The aircraft manufacturers also went to the airlines to determine their respective needs for equipment fleets and service routes. The Federal Aviation Administration subsequently used cost/benefit analyses to determine the priorities for airport infrastructure investments under the Airport Improvement Program. Participants asked that if vessel manufacturers and steamship lines are demanding that the ports and public as well as private transportation providers make major infrastructure improvements, wouldn't there be a way for the Federal Government to consider similar investments for ports and access for those ports? During the meetings it was noted that there is much more cooperation between airport planners, plane manufacturers, airlines and airports than there is in the maritime industry.

Some attendees at the meetings called for the Federal Government—through the Departments of Transportation and Defense—to take an active role in the decision making process that determines the locations of U.S. hub ports that will serve megaships. Government commitments will be particularly effective in influencing the port terminal investments and contracts made by big steamship lines. Those attendees contended that if the Federal Government doesn't take affirmative steps, and megaships ports are located in other countries or offshore, then the United States will become both economically and militarily disadvantaged. Other participants offered an opposing point of view—that the Federal Government should not attempt to select ports for development as megaship hubs—and these decisions should be left, instead, to the marketplace.

Many of the representatives from the maritime and international trade industry also questioned how they could be expected to address issues in a coordinated fashion when there hasn't been an effective integration of programs and funding sources within USDOT and other agencies. In the view of many meeting participants, if the Federal Government is serious about preserving the Nation's competitive edge in trade and an adequate platform for military deployment, then Federal agencies such as USDOT and DOD will have to make decisions on how transportation investments are going to be made to accomplish these objectives. Participants believed that a lack of coordination between users and customers in the maritime industry is compounded by uncoordinated Federal programs and the lack of funds for systemic transportation improvements, such as port-related freight movements. These problems result from an absence of centrality in Federal policy, and separate funding sources that are overly restrictive in project eligibility.

The feedback from the regional meetings clearly called for Federal agencies to provide a planning framework for economic analysis that could assess implications of larger scale, corridor-based transportation improvements. By using a framework based on cost/benefit analysis, agencies could make sure investments are not frustrated at some distant point by guaranteeing a funding stream for projects that were shown to be meritorious. These analyses would consider transportation investments based on project significance in terms of domestic and international traffic. Another criterion would be the partnerships that the corridor users created to match public and private funding for transportation improvements. Loan guarantees could be earmarked to ensure that when local money was committed to the project, Federal money would be there.

Port and other transportation industry participants recognized the dilemma in not wanting port rationaliza-

tion or national transportation planning, but wanting the Federal Government to set priorities for major transportation investments. Those at the meetings acknowledged that such Federal oversight had been required in the past for programs such as the Interstate Highway System, aviation, and ports and waterways, but were concerned nonetheless about the consequences of a process that might not see merit for their own programs or operations due to an inability of the Federal Government to adequately assess local factors. Transportation professionals at the State and local levels and in the private sector agonize over the development of cost/benefit ratios that would scale their requests on the basis of being in the national interest. Meeting participants asked if, in addition to providing money for large scale capital improvements, the Federal Government could create incentives to reward public and quasi-public entities for becoming more transportation efficient.

At all of the regional meetings, those in attendance recognized that there are difficulties in determining which projects the Federal Government should participate in, what levels of Federal investment should be made, which issues should be considered when we coordinate and allocate our limited resources, and how the Federal Government's program can be consolidated to provide more meaningful investments. In laying out a rational process for making investments, these participants pointed out that the political process represents an unpredictable element. Those who would rely on a ranking process would have to assume that logic will carry the day when making their case. While those commenting noted that making a sound case for infrastructure investment was essential, this action alone would not guarantee success because there are local, State, and national political processes involved—each with their own sets of unique and sometimes conflicting priorities. Concerted action would have to be taken on both analytical and political processes if sound, quantitatively-based frameworks for project investment are to be approved.

Some of the meeting participants called for Federal policies that would allow more flexible use of revenues derived from the Harbor Maintenance Tax. These participants were aware of the uncertain status of the Harbor Maintenance Tax following a June 3 decision by the Federal Circuit Court that found the tax to be unconstitutional when levied on export cargo. But those at the meetings also pointed out that the amount of revenues collected by the Harbor Maintenance Tax and deposited in the Harbor Maintenance Trust Fund exceeded the expenditures from the Trust Fund for maintenance purposes. The Trust Fund was projected to have a surplus exceeding \$800 million at the end of Fiscal Year 1996, and attendees questioned why these revenues couldn't be spent on infrastructure improve-

ments. Regardless of the funding mechanism that is used, industry representatives called for the U.S. DOT to provide a more logical user-based fee to eliminate the disparity between donors and donees and greater flexibility to finance other improvements necessitated by growth.

Those attending the meetings also urged that additional sources of revenue, such as Customs revenues, be made available for making infrastructure improve-

ments. If transportation infrastructure is required to handle the international trade products entering the United States, participants questioned why portions of these trade revenues could not be used for infrastructure improvements, including inland connections and corridors that can be directly linked to international port traffic. These people advocated that more of the fees and duties collected at the ports ought to be returned to the ports that collect them.

## Summation

In this era of dynamic developments in transportation, USDOT is reviewing its responsibilities to its constituents in the formalization of policy, decisionmaking, coordination of interstate activities and funding. In the course of the four regional meetings held around the country, many participants urged the Federal Government to assume the roles of primary analyst, advocate, and partner on issues involving major transportation investments occasioned by megaships calling on U.S. ports and other next generation vessels, such as FastShip Atlantic, now in the planning stages. The USDOT was encouraged to develop analytical frameworks and processes for prioritizing transportation investments of regional and national significance, and to provide mechanisms through which these investments could be made. Federal agencies were asked to embrace mutually supportive policies that are more sensitive to the demands of the marketplace and pursue approval processes that are based on project merits and are comparatively free of political intervention.

The regional meetings on projected increases in international freight movements produced the following general conclusions:

- ◆ There are numerous infrastructure, regulatory, institutional, operational, and technological issues and opportunities that may impact U.S. ports and the inland intermodal transport system as a result of significant changes in ship design and operation.
- ◆ The development of a safe and efficient international intermodal trade transport system will require a coordinated set of actions involving a wide range of parties and institutions, both public and private.
- ◆ In the absence of a central authority tasked with overall responsibility to address the challenges of increased intermodal movements of international freight, the achievement of a coordinated set of actions would benefit from continuous attention to these issues, rather than the periodic and disjointed reviews and appraisals.

Meeting participants suggested that the Federal Government could come to the table with a portfolio to look for common solutions and bring all of the parties together who would have an interest in the project and would be asked to make a financial commitment. Where there are common interests on transportation issues, the USDOT was asked to take the lead and get involved with its constituents and other Federal agencies. Several participants cautioned, however, that any partnership of government with business requires that the private sector stay committed to the cause, and that this was a hard commitment to secure.

Those attending the regional meetings noted that the Federal Government also could play an important role by providing consistent information about what is going on elsewhere in the country. Participants observed that good information simply isn't passed on to them about what planning and investment strategies being employed in other regions or States. This clearinghouse function would entail several components, including information on transportation statistics, policy statements, rulemaking activities, best practices, and educational opportunities.

The dynamics of a customer-driven marketplace with developments such as megaship service, faster shelf-to-shelf movement and superior service create ever-increasing demands for our transportation system. The common question faced by ocean carriers, shippers, port and rail operators, truckers, and transportation agency representatives is how to provide transportation service to address these needs and meet the challenges that lie ahead. Complex issues are involved and there is no single solution that can be applied. Many of the problems that need to be resolved will require congressional action. Many will require action by several Federal agencies. There are only a limited number of issues that can be addressed solely from the perspective of the U.S. Department of Transportation.

Part of the problem lies in the proliferation of regulations and multi-agency oversight. There are very disjointed processes at Federal, State and local levels, and among public and private sector groups. Stakeholders in freight transportation need to find ways to cooperate better out of self-interest. The meeting participants called for the Federal Government to assist in the planning process by creating mechanisms to bring freight issues to the table. A venue is needed for ongoing dialogue that will get the private sector involved in freight policy development. Federal agencies must address the performance expectations of military and commercial customers through outreach, education, technical assistance, and collaboration.

## Next Steps

To address the complex issues raised by the introduction of larger ships and more international freight into the transportation system, the USDOT will undertake two new initiatives. One of these "next steps" will involve a Waterways Transportation Management initiative led by the U.S. Coast Guard and the Maritime Administration. The second initiative will be a comprehensive study by the Federal Highway Administration (FHWA) with assistance from other USDOT operating administrations, that will address National Highway System Intermodal Connectors Performance and Needs Evaluation.

Under the USDOT Waterways Transportation Management initiative, the U.S. Coast Guard and the Maritime Administration will work to improve an integral component of our national transportation system—the safety and efficiency of our ports and waterways. Waterways Transportation Management will

focus on policy coordination at the national level and action at the local port level. Adequate infrastructure, including channel and berth depths, navigation information, port facilities, intermodal connections and information management to accommodate all classes of marine vessels—including large container vessels—are among the waterways issues encompassed within this initiative. The Waterways Transportation Management initiative will begin with a series of regional outreach meetings in the Spring of 1998 to solicit input from transportation stakeholders.

The National Highway System (NHS) Intermodal Connectors Performance and Needs Evaluation Study will compile information on the NHS connections to major passenger and freight intermodal terminals that were identified by the FHWA in cooperation with the States and submitted to Congress for approval in May 1996. These connections totaled 2032 miles and served 1407 terminals, of which 500 were freight terminals. Because very limited information exists on the conditions and performance of these NHS intermodal connectors, the FHWA is proposing a study—with assistance from other USDOT operating administrations—that will:

- 1) Evaluate highway infrastructure condition of National Highway System (NHS) connections to major intermodal terminals.
- 2) Identify improvements that have been made or are being planned for intermodal connections and identify impediments to making improvements to them.
- 3) Identify other non-highway infrastructure, regulatory, institutional and operational impediments to intermodal terminal access.

The drafting of a work plan for the NHS Intermodal Connectors Performance and Needs Evaluation Study began in January 1998, and a report on the study findings is planned for the summer of 1999.

These next steps will address the infrastructure, regulatory, and institutional issues raised by the dramatic increases projected for international freight from both a landside and waterside transportation perspective, and build upon the information gained through the recent round of megaships outreach meetings. The Department of Transportation believes that these actions represent a reasonable and timely response that is in keeping with the wishes of its constituents and its responsibilities as a steward of our nation's transportation system.

# Appendix A

## Background Information

*This technical appendix presents background information on the introduction of megaships and their consequences for market and industry trends, projected impacts on infrastructure, and projected impacts on transportation operations. This resource material was prepared for the participants at the four regional meetings by USDOT's principal consultant for the megaship study, Vickerman-Zachery-Miller (VZM), a division of TranSystems Corporation. Mr. John Vickerman of VZM served as facilitator for the first day's discussions at each of the regional meetings, and relied upon this material in leading group discussions of these issues.*

### MARKET & INDUSTRY TRENDS OVERVIEW

#### Introduction

This background section provides an overview of trends relating to world and U.S. container trade with an emphasis on U.S. Atlantic, Pacific and Gulf Coast ports. It presents current information on the physical characteristics and projected utilization of next-generation containerships. Other significant trends are identified in the areas of terminal infrastructure, waterside access, landside access, terminal operations and shipping logistics.

Between 1991 and 1995, world container trade grew at an incredible rate of 9.5% per year, reaching more than 134 million twenty-foot equivalent container units (TEUs) in 1995. Growth in the U.S. trades has been somewhat lower, but still extremely rapid, at 6.0% per year to reach more than 21 million TEUs in 1995. Worldwide growth is forecast at a CAGR of 8.0% through the year 2000 and total U.S. growth is forecast at 7.8% through 2010.

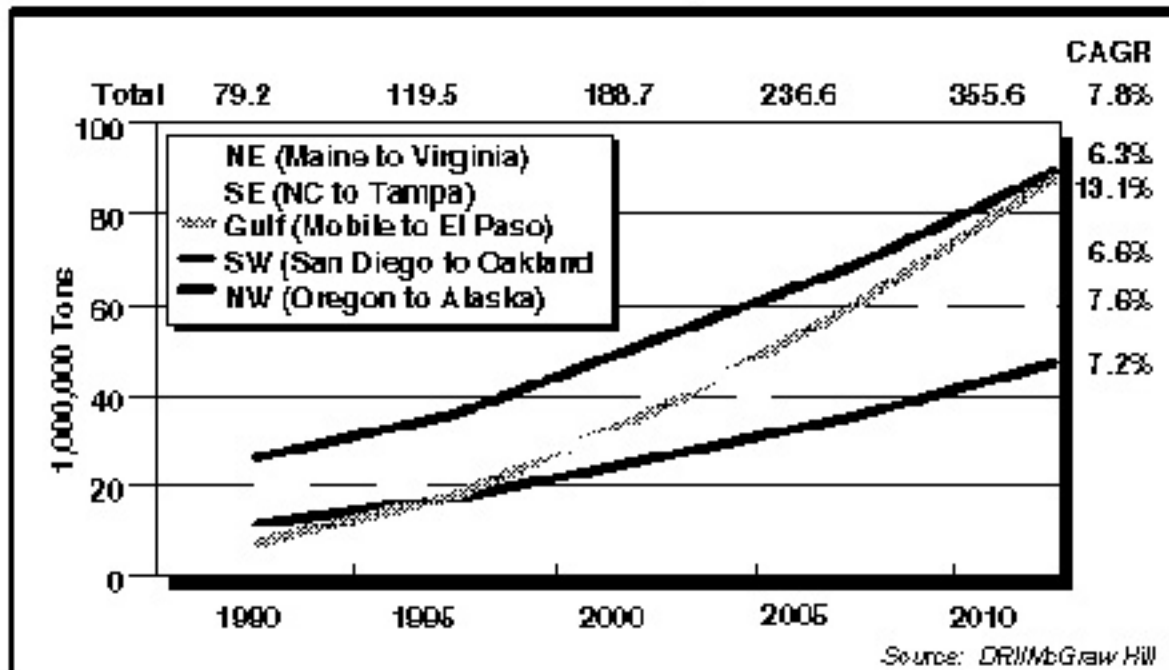
The leading world ports in 1995 were Hong Kong (12.5 million TEUs), Singapore (10.8 million TEUs) and Kaohsiung (5.2 million TEUs). Long Beach, CA, the leading U.S. port, ranked seventh. Among U.S. ports, the leaders in 1995 were Long Beach (2.8 million TEUs), Los Angeles, CA (2.6 million TEUs)

#### Canada/U.S. Port Container Traffic (TEUs), 1996

1. Long Beach	3,067,334	11. Houston	794,481
2. Los Angeles	2,882,802	12. Port Everglades	701,281
3. New York/New Jersey	2,269,500	13. Miami	656,798
4. San Juan (PR)	1,840,824	14. Savannah	650,253
5. Oakland	1,498,202	15. Vancouver (BC)	616,892
6. Seattle	1,473,561	16. Jacksonville	613,448
7. Hampton Roads	1,141,357	17. Baltimore	474,816
8. Charleston	1,078,590	18. Honolulu	453,044
9. Tacoma	1,073,471	19. Halifax	392,273
10. Montreal	652,530	20. Anchorage	337,770

Source: AAPA, 1997

## U.S. Containerized Tonnage Forecast



and New York/New Jersey (2.3 million TEUs). According to recent 1996 figures, Long Beach has climbed to 3.0 million TEUs and Los Angeles traffic has increased to nearly 2.7 million TEUs.

### Atlantic Coast Ports

Looking at Atlantic ports, the 1996 leaders in terms of TEUs are New York/New Jersey (2,269,500), San Juan PR (1,640,624), Hampton Roads, VA (1,141,357), Charleston, SC (1,078,590), Montreal, Quebec (852,530), Port Everglades, FL (701,281) and Miami, FL (656,798). Between 1985 and 1996, Atlantic ports grew at a combined Compound Annual Growth Rate (CAGR) of approximately 4.6%, which is lower than the world rate and slightly lower than the overall U.S. rate of 6.0%. Some ports—particularly Hampton Roads, Charleston, Port Everglades, Miami and Jacksonville, FL—grew at or near double-digit rates in this period, while others experienced moderate growth or stable traffic. Forecasts by DRI/McGraw-Hill (DRI) suggest that the Atlantic ports are poised for more rapid growth, with Northeast ports (Maine to Virginia) projected at an aggregate 6.6% CAGR and Southeast ports (North Carolina to Florida) projected at an aggregate 7.6% CAGR.

### Pacific Coast Ports

Looking at West Coast ports, the leaders behind Long Beach and Los Angeles (2.8 and 2.6 million TEUs, respectively) are Oakland, CA (1.5 million TEUs), Seattle, WA (1.5 million TEUs), Tacoma, WA

(1.1 million TEUs), Honolulu, HI (0.8 million TEUs) and Vancouver, BC (0.5 million TEUs). Total West Coast container trade reached 11.4 million TEUs in 1995. Between 1985 and 1995, West Coast ports grew at a combined CAGR of 7.9%, which is close to the world rate and significantly better than the overall U.S. rate of 6.0%. Most ports more than doubled their container volumes in this period, with the strongest growth in Long Beach, Los Angeles, Tacoma, Vancouver, BC and Portland, OR. Future volumes through the Northwest ports (Oregon to Alaska) are forecast at a CAGR of 7.2%, while Southwest ports (Oakland to San Diego) volumes are forecast at a CAGR of 6.3%.

### Gulf Coast Ports

Looking at Gulf Coast ports, the 1996 leaders in terms of TEUs are Houston, TX (794,000), Veracruz, Mexico (265,000), New Orleans, LA (261,000), Gulfport, MS (153,000), Freeport, Bahamas (48,000), Lake Charles, LA (34,000) and Fernandina (32,000). Between 1985 and 1995, Gulf Coast ports grew at a combined CAGR of approximately 3.3%, which is lower than the world rate and the overall U.S. rate of 6.0%. Some ports—particularly Houston and Gulfport—experienced strong growth in this period, while others remained stable or lost container traffic. Forecasts suggest that the Gulf is poised for a major upturn in container traffic due to containerization of bulk cargo, increased trade with Mexico, Latin America and South America, and other factors, with growth rates possibly reaching as high as 13.1% annually.



## NEXT-GENERATION VESSELS AND MARKET PENETRATION

To move these increasing volumes, some shipping companies have ordered larger, faster vessels. One advantage is that with increasing size and speed, the transport cost per TEU slot is reduced—provided that these slots are filled with revenue cargo. As of November 1996, the large majority of vessels in the world container fleet were in the “Feeder” class (less than 1000 TEUs). The 36 megaships (vessels in excess of 4,500 TEUs) in service accounted for only 1% of the total fleet by number. However, 45 megaships are currently on order, representing 8% of the order book and about 18% of the new capacity on order.

Recent and planned deployments through 1997 include six ships by the shipping line COSCO, 5 by Hanjin and 5 by Hyundai, all in excess of 5,000 TEUs. The largest is the “Regina Maersk” class at 6,000 TEUs. These vessels will be deployed in the Far East/Pacific and Far East/European trades. In addition to the planned 1997 deployments, there are another 28 megaship orders, including P&O/Nedlloyd’s order for six container ships with capacities of 6,674 TEUs—the largest in the world.

### Impacts of Larger Vessels

In 1990, less than 6% of U.S. containerized cargo was handled on ships of 4,000 TEUs or more. By 2010, almost 30% is projected to be handled on ships in the 4,000 to 6,000 TEU class, with more than 9% in the 6,000 to 8,000 TEU class. It must be emphasized that these are maximum figures assuming

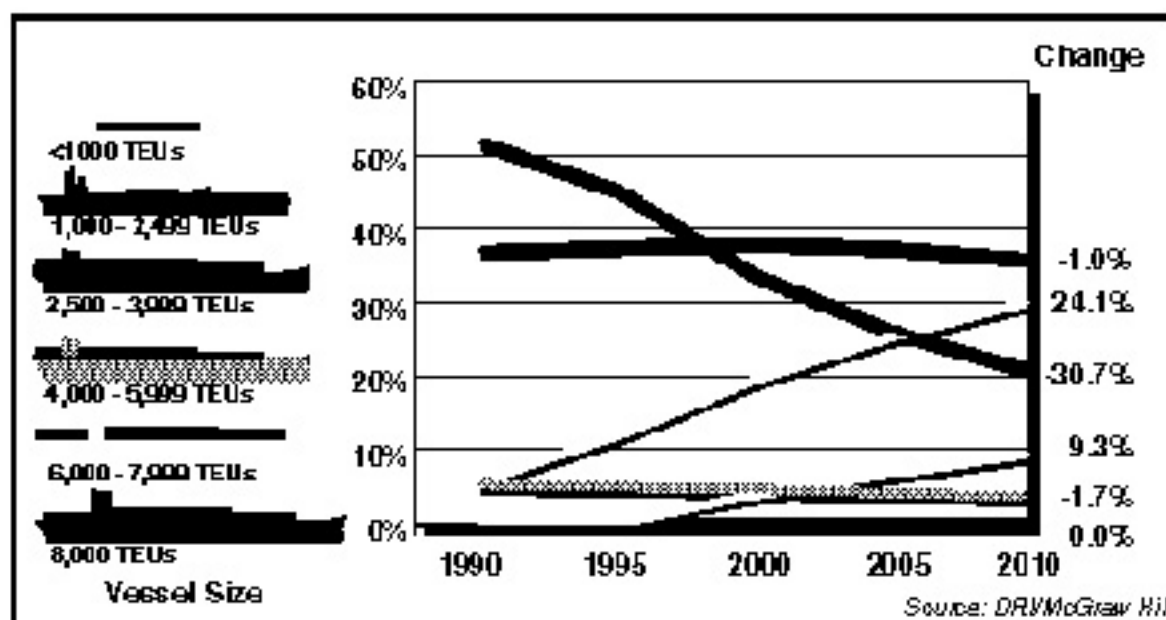
“unconstrained” conditions—that is, they assume that (a) the infrastructure would be available to handle these vessels, and (b) that carriers would find it profitable to deploy them on U.S. itineraries. To the extent that these assumptions are not proven out, the share of cargo handled by megaships would be less.

Ports that can accommodate megaships are in a position to capture this market. However, “smaller” ships in the Panamax (2,500 to 3,999 TEU) class are forecast to maintain their current share (36%) of cargo. In 1990, these ships moved more than 29 million TEUs to and from U.S. ports; just by maintaining share, their total tonnage will more than quadruple to 128 million TEUs in 2010, making them the most heavily-used class of ship in U.S. services. This is critically important, because it suggests that ports that can accommodate these ships (but not megaships) will continue to play a major role in future U.S. shipping, and that there are major consequences for transportation throughput facing the majority of U.S. ports that will not be called upon by megaships.

### Containership Size Limits

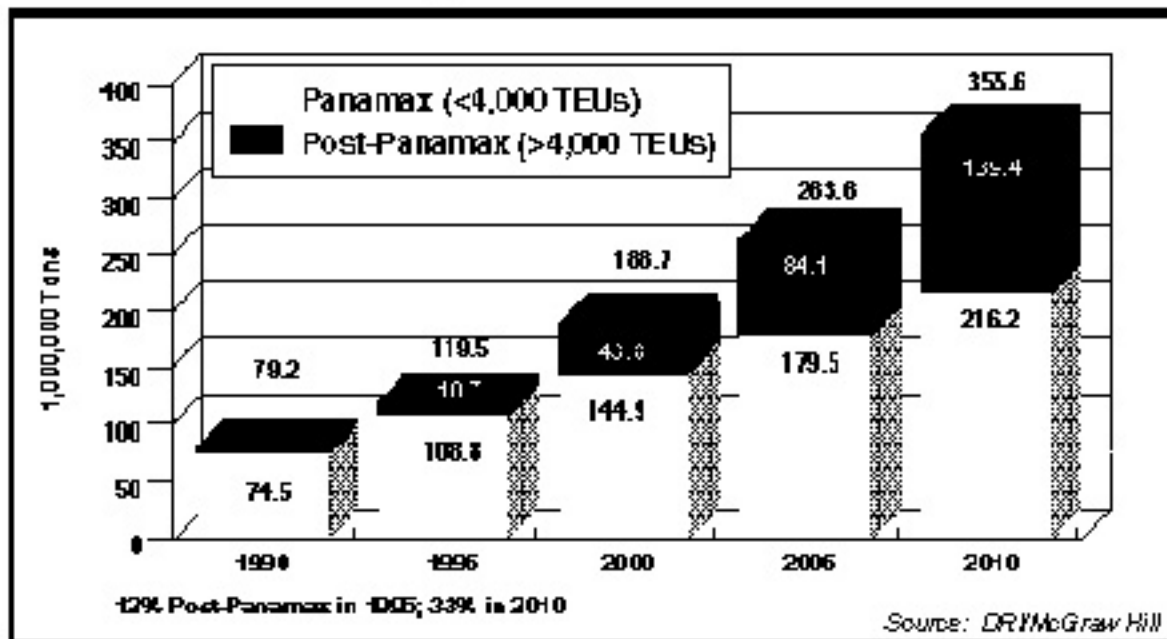
The physical and operational characteristics of ships change as their capacity increases, placing increasing demands on navigation channels, port infrastructure and landside access capabilities. “Panamax” vessels (the largest that can transit the Panama Canal) average 896 feet in length and not more than 106 feet across the beam, with a draft just over 39 feet. The largest “Post-Panamax” ships in the fleet today average around 925 feet in length and 125 feet across the beam, with a draft of over 43 feet. Looking at four of

Forecast Share of U.S. Containerized Tonnage by Vessel Type





## U.S. Containerized Tonnage Forecast—Panamax vs. Post-Panamax Vessels



the newest megaships—the Regina Maersk, Hanjin London, Hyundai Independence and APL C-11 class—the maximum length (1049 feet) and beam (140 feet) belong to the Regina Maersk, while the maximum drafts (46 feet) are shared by the other three vessels. HDW in Europe has proposed a 8,000 TEU ship that is 1,099 feet in length.

Much larger vessels are technically feasible. However, between 7,000 and 8,000 TEUs, it will become increasingly difficult for container ships to make required speed (24 knots or more) using today's single-engine propulsion systems. This barrier may be overcome through advances in propulsion systems and hull design, or by adding a second propulsion shaft. With a second shaft, vessel cost can jump dramatically but the cost per TEU slot can be minimized by making the ship as large as the new propulsion capacity allows. In fact, P+O Containers has raised the idea that the largest single-propulsion vessel (say 7,500 TEUs) could be doubled in capacity to 15,000 TEUs by adding a second propulsion shaft; they opine that "the ship is a flight of fancy ... but such a ship is within the current state of the shipbuilder's art.

Other factors may be more significant in setting a maximum container ship size. First, is there a deployment scenario that would allow a shipping company to keep the ship full enough and in motion often enough to pay for itself? Second, can you find water sufficiently deep to meet vessel deployment requirements? Third, can you find a terminal to handle it? Fourth, can you afford extensive transshipment and landside rail and truck transportation to serve markets outside your ports of call? With increasing vessel size, the

deployment options and potential ports of call become sharply limited, and at some point it becomes uneconomical for ports, the U.S. Army Corps of Engineers and others in the freight movement chain to improve their access and infrastructure to service these vessels.

It may be hard to imagine much use for a ship larger than 8,000 TEUs or drafting more than 46 feet, due to the limited itineraries these ships would have and the channel depth constraints that would have to be overcome. But history is clearly against such limit-setting. Ten years ago, few imagined a 6,600 TEU vessel, and today it is under construction. It is possible that certain high-traffic corridors (e.g., Hong Kong to Long Beach/Los Angeles or Seattle/Tacoma) might see vessels larger than 8,000 TEUs in pendulum services or hub-and-spoke strategies.

### Other Vessel Technologies

Besides megaships, there is another important trend in container ship development—very fast container ships, such as FastShip Atlantic and Japan's TechnoSuperLiner. The next few years will be important in determining the penetration of these technologies and services into the marketplace.

### Fleet Capacity

Finally, the extent of new shipbuilding raises the question of potential overcapacity. There are about 4.8 million TEU slots in the existing fleet. With 1.1 million TEU slots in vessels (of all sizes) on order, the capacity of the world fleet will soon be increased by 22%. Will the market be able to absorb this new slot capacity?

## PROJECTED IMPACTS ON INFRASTRUCTURE

*This background section provides an assessment of infrastructure impacts and requirements associated with next-generation container ships. Areas of examination include navigation channels, terminal design and equipment, landside access, port capabilities and planned improvements.*

### Navigation Channels

Panamax vessels typically draft 38 feet. Allowing 2 feet for vertical ship movement and 2 feet for under-keel clearance, these ships require a 42-foot channel. With Post-Panamax vessels, draft increases to around 42 feet (fully loaded) and a 46-foot channel is required. With megaships, maximum fully weight-loaded draft is estimated at 46 feet, requiring a 50-foot channel.

Ports that can provide channel depths approaching 50 feet or more are clearly advantaged, as they can handle heavily loaded megaships as the sole U.S. port of call, or as the first in/last out call on a multi-port service. For certain services (involving shallower-draft or less than fully-loaded vessels), a 45-foot draft may be adequate.

It appears that drafts less than 45 feet will not be sufficient to handle megaship services. Even so, shallower-draft Atlantic ports should do well over the next two decades because: (1) smaller vessels are projected to handle the majority of tonnage through 2010; (2) light-loaded megaships can call at these ports on second in/out services; and (3) overall demand for container capacity in the Atlantic is expected to nearly triple by 2010, with the largest share of cargo in the Panamax vessel class (which can be accommodated at shallower drafts).

### Atlantic Coast Ports

Looking at current permitted navigation channel depths at Atlantic container ports, three—Halifax, NS, Baltimore, MD and Hampton Roads—provide navigation channels at or below 50 feet. However, the deepest berths at these ports are 47 feet at Halifax, 45 feet at Hampton Roads and 42 feet at Baltimore. Several Atlantic ports (including New York, Charleston and Savannah, GA) are planning to deepen their channels and berths.

### Pacific Coast Ports

The West Coast has four ports at 50 feet or deeper: Seattle, Tacoma, and Vancouver, BC, in the north and Long Beach in the south. To reach 50 feet, main channel improvements would be needed in Los Angeles (5 feet), Oakland (8 feet) and Portland (10

feet) to handle fully-loaded megaships. The need for improvements to turning basins to handle longer ships could also be triggered. Los Angeles has a project underway to deepen to 50 feet. Oakland is also talking about the need for 50 feet. However, prior dredging in the Bay area has been difficult due to environmental and permitting issues.

### Gulf Coast Ports

No container port on the Gulf Coast provides 50 feet. The Houston Ship Channel is currently at 40 feet, with approval to deepen to 45 feet. New Orleans has a 45 foot main channel with 35 feet at its container berths, and has no plans to deepen. Gulfport provides 36 feet and has no plans to deepen.

## TERMINAL DESIGN AND EQUIPMENT

*Terminal design and equipment are substantially impacted by the deployment of megaships, particularly with respect to wharf crane and container storage requirements and the degree of transshipment that occurs at the facility.*

### Wharf Cranes

As container ships have become larger and wider, wharf cranes have evolved to serve these vessels. Panamax cranes (less than 144 feet outreach) serve Panamax vessels (106 ft beam, with up to 13 container rows across the beam). Post-Panamax cranes (144-158 feet outreach) serve vessels between 13 and 16 containers wide.

The first megaships were designed with 40.0 meter beams (about 16 containers wide) and could be handled by the largest Post-Panamax cranes. However, the emergence of wider megaship designs forced the development of the Beyond Post-Panamax (BPP) crane (greater than 158 feet outreach) to handle 17-wide and 18-wide ships.

In 1995, Panamax cranes dominated with world crane population (77%), while BPP cranes accounted for just 3%. This is changing rapidly—looking at deliveries from 1996 through 1998, BPP cranes represent 44%, with Panamax at 30% and Post-Panamax at 23%. This trend is even more pronounced in North America; with BPP cranes representing 55 of 66 deliveries (83%).

How many BPP cranes will it take to unload a megaship? This depends on a number of variables including the size of the vessel, percent of vessel cargo to be offloaded/loaded, productivity of the cranes and the amount of time the vessel can remain at berth. In normal services, a ship makes several calls and